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PAPER MACHINERY

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FIG-1

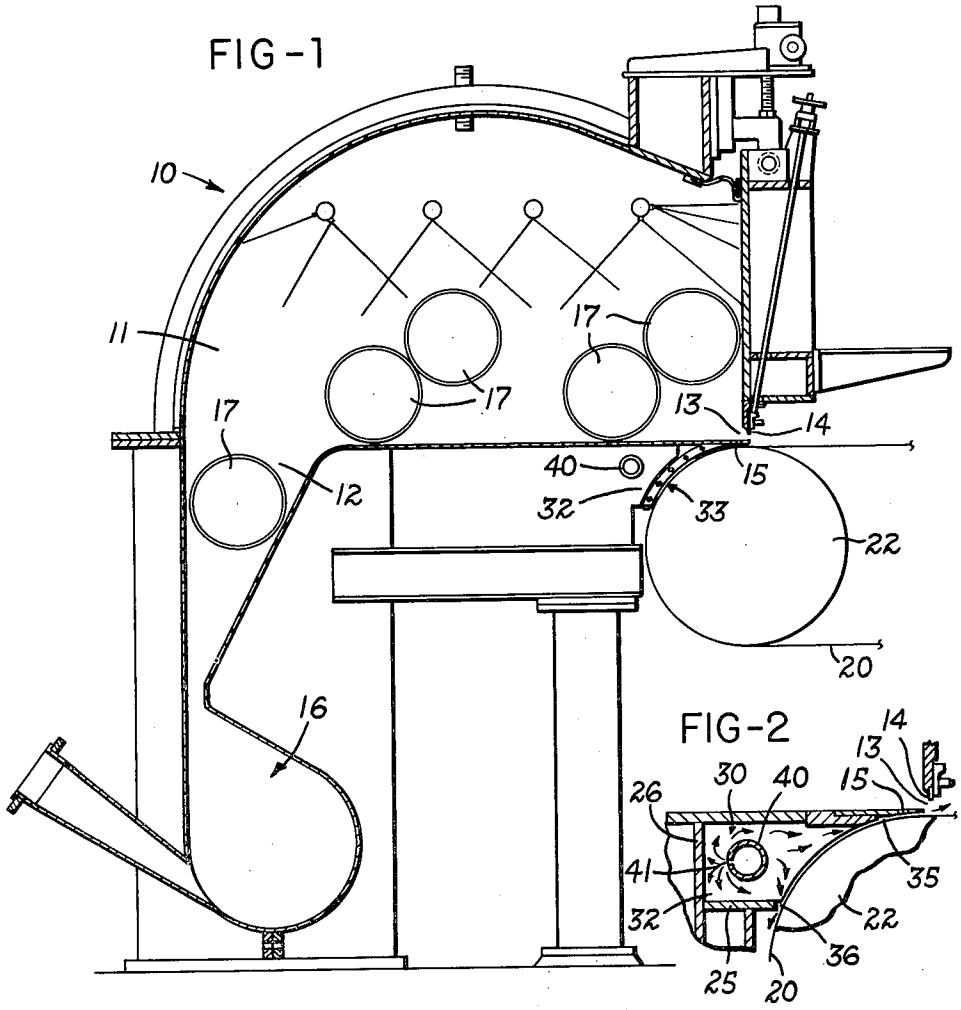
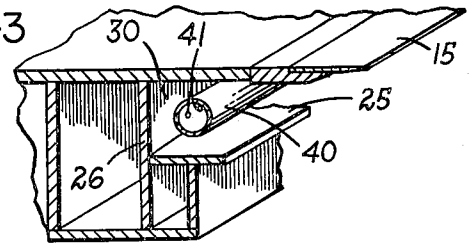


FIG-2

FIG-3



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This invention relates to paper making machines of the Fourdrinier type.

The invention is particularly concerned with the relation between the air currents which exist in the immediate vicinity of the initial forming zone of Fourdrinier type paper machines and the quality of the sheet produced thereon. More specifically, as the bare wire approaches the forming zone, it tends to carry a certain amount of windage therewith, some of which is likely to be trapped between the breast roll and the lower slice lip as the stock is deposited on the wire. Such trapped bubbles of air therefore interfere with the desired uniform deposit of stock on the wire and also create an undesirable boiling action as they attempt to break free of the liquid stock. It will also be apparent that these conditions increase in severity with increase in the speed of operation of the machine.

It is a primary object of the present invention to overcome the difficulties outlined above by the provision of a Fourdrinier paper machine of such structure and mode of operation that it is not possible for air to be trapped by or entrained with the stock as it is discharged onto the wire.

It is a specific object of this invention to provide a Fourdrinier type paper machine wherein a steam compartment is located in such relation with the slot between the slice lip and the breast roll that steam will continuously bleed through this slot to prevent trapping and entrainment of air with the stock as it impinges on the forming wire.

An additional object of the invention is to provide a Fourdrinier type paper machine as outlined above wherein the steam compartment is so located and arranged with relation to the portion of the breast roll approaching the slice lip that the steam serves also to strip the wire of all windage before the wire enters the forming zone.

It is also an object of the invention to provide a steam compartment structure for a Fourdrinier type paper machine as outlined above which is readily applicable to existing paper machines and will afford thereon the same advantages in operation as when it is built directly into a new machine.

Additional objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawing:

FIG. 1 is a somewhat diagrammatic view in side elevation showing an illustrative headbox constructed in accordance with the invention;

FIG. 2 is an enlarged fragment of FIG. 1 in vertical section through the lower slice lip; and

FIG. 3 is a fragmentary perspective view of the same portion of the headbox as FIG. 2 with the breast roll removed.

Referring to the drawing, which illustrates a preferred embodiment of the invention, the headbox indicated generally at 10 in FIG. 1 includes a flow chamber 11 having a stock inlet connection 12 at the back thereof from which the stock flows to the slice outlet 13 defined by the upper and lower slice lips 14 and 15. The stock inlet indicated generally at 16 may be of any suitable structure and does not constitute a part of the present

invention, and similarly the headbox may incorporate any suitable arrangement of rectifier rolls 17.

FIGS. 1 and 2 show a fragment of the forming wire 20 approaching and passing around the breast roll 22 to receive stock from the outlet 13, and the invention is concerned with the air currents in the immediate vicinity of the outlet 13, particularly with preventing the trapping and entrainment of air with the stock as the stock is first deposited on the wire and breast roll. In accordance with the invention, walls 25 and 26 cooperate with the underside of the lower slice lip 15 to define a compartment 30 which extends the full length of the breast roll 22, and the front wall of which is formed by the angular portion of the breast roll between the outer edges of the slice lip 15 and wall 25. Each end of this compartment 30 is closed by an end wall 32 which includes a suitable seal assembly 33 engaging the surface of the breast roll 22, but neither the lip 15 nor wall 25 touches the breast roll, and instead these parts are arranged in closely spaced relation to provide definite slots 35 and 36 therebetween.

Provision is made for supplying the interior of the compartment 30 with steam under maintained pressure sufficient to assure continuous substantially uniform discharge thereof through both of the slots 35 and 36. More specifically, the objectives of the invention are achieved if the steam pressure within the compartment 30 is maintained continuously slightly in excess of the pressure generated by the windage on the wire at the inlet slot 36 to the compartment 30, since under such conditions, the steam will effectively strip the wire of entrained air as it enters the compartment 30. In addition, the steam which escapes through the exit slot 35 serves both to lubricate the slice lip and particularly to prevent trapping of air between the stock and the breast roll by acting as a displacing force blocking air from access to the wire at this location.

Desired conditions for such control escape of steam are obtained by extending a steam supply pipe 40 throughout substantially the full length of the compartment 30 and by providing this steam pipe with multiple outlets 41 which preferably are directed away from the surface of the breast roll. Thus with these outlets arranged shown in FIGS. 2 and 3 to discharge toward the compartment wall 26, this wall acts as a baffle to absorb the discharge velocity of the steam and convert it to a maintained pressure condition throughout the compartment for the desired controlled bleeding of steam through both of the slots 35 and 36.

It will be apparent in view of the above explanation of the principles of this invention that specific steam supply and pressure conditions are readily calculated in accordance with the size and speed of a given paper machine, with the requirements increasing as the speed of the machine may be increased. It is also significant to note that while the steam which is discharged through the slot 35 will virtually entirely be condensed with the stock on the wire, this in itself has further advantages. In particular, the condensing of the steam will necessarily produce a corresponding increase in the temperature of the stock wherein the steam is absorbed, with resulting lowering of the viscosity of the water and increased ease of draining. It also appears that to the extent that condensation of the steam takes place directly within the wire, it will further serve to facilitate drainage through the wire.

It should further now be apparent that constructions embodying the invention are as readily adapted to existing paper machines as they are built into new machines. This is particularly the case with the lower slice lip lending itself to use as one wall of the steam compartment, and also since neither the volumetric size of this

compartment nor the specific slot clearances between its walls and the breast roll are of more than practical significance. The invention accordingly offers important practical and economic advantages with minimum requirements of both initial and maintenance cost.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a paper machine including a headbox, a breast roll around which the forming wire travels, and a lip forming one side of thhe outlet through which the stock flows from the headbox onto the breast roll, the combination of means cooperating with said lip to define a compartment on the opposite side of said lip from said outlet with one side thereof formed by the portion of said breast roll approaching said outlet, a supply source of steam under pressure, and means forming a connection leading from said supply source to said compartment for continuously introducing steam into said compartment at a pressure sufficient for continuous discharge thereof between the outer edge of said lip and said breast roll.

2. In a paper machine including a headbox, a breast roll around which the forming wire travels, and a lip forming one side of the outlet through which the stock flows from the headbox onto the breast roll, the outer edge of said lip and said breast roll being in closely spaced relation providing a slot therebetween, the combination of means defining a compartment located on the opposite side of said lip from said outlet and communicating directly with said slot, a supply source of steam under pressure, and means forming a connection leading from said supply source to said compartment for continuously introducing steam into said compartment at a presure sufficient for continuous discharge thereof through said slot.

3. In a paper machine including a headbox, a breast roll around which the forming wire travels, and a lip forming one side of the outlet through which the stock flows from the headbox onto the breast roll, the outer edge of said lip and said breast roll being in closely spaced relation providing a slot therebetween, the combination of means including a wall and the opposite side of said lip from said outlet defining a compartment including as one side thereof the portion of said breast roll between said wall and said lip, said wall being in closely spaced relation with said breast roll providing a slot therebetween, means forming seals between the ends of said compartment and said breast roll while maintaining said slots between said breast roll and said lip and wall, a supply source of steam under pressure, and means forming a connection leading from said supply source to said compartment for continuously introducing steam into said compartment at a pressure sufficient for continuous discharge thereof through said slots.

4. In a paper machine including a headbox, a breast roll around which the forming wire travels, and a lip forming one side of the outlet through which the stock flows from the headbox onto the breast roll, the combination of means including said lip and an angular portion of the surface of said breast roll approaching the outer edge of said lip defining a compartment extending the length of said breast roll, a conduit extending substantially the full length of said compartment and having multiple outlet means in the side thereof facing away from said breast roll and said lip, a supply source of steam under pressure, and means connecting said conduit to said supply source of steam to maintain said compartment filled with steam under pressure sufficient for continuous discharge of said steam between the outer edge of said lip and said breast roll.

5. In a paper machine including a headbox, a breast roll around which the forming wire travels, and means including a lower slice lip defining an outlet through which the stock flows from the headbox onto said breast roll, the combination of means maintaining said lip with the outer edge thereof in closely spaced relation with said breast roll providing a slot therebetween, walls cooperating with said lip and the adjacent portion of said breast roll to form a compartment extending below said lip for substantially the full length of said breast roll, means forming seals between the ends of said compartment and said breast roll while maintaining said slot between said lip and said breast roll, a supply source of steam under pressure, and means forming a connection leading from said supply source to said compartment for continuously introducing steam into said compartment at a pressure sufficient for continuous discharge thereof through said slot.

6. In a paper machine including a headbox, a breast roll around which the forming wire travels, and means including a lower slice lip defining an outlet through which the stock flows from the headbox onto said breast roll, the combination of means maintaining said lip with the outer edge thereof in closely spaced relation with said breast roll providing a slot therebetween, means including a bottom wall cooperating with said lip and the angular portion of said breast roll between said bottom wall and said lip to form a compartment extending below said lip for substantially the full length of said breast roll, said bottom wall and said breast roll being in closely spaced relation providing a slot therebetween, means forming seals between the ends of said compartment and said breast roll while maintaining said slots between said breast roll and said lip and bottom wall, a supply source of steam under pressure, and means forming a connection leading from said supply source to said compartment for continuously introducing steam into said compartment at a pressure sufficient for continuous discharge thereof through both of said slots.

7. The method of eliminating air bubbles from the forming wire of a paper machine immediately prior to the delivery of stock thereto which comprises applying steam to said wire under controlled pressure conditions causing said steam to displace air from within the interstices of said wire, and maintaining said steam pressure conditions throughout said wire and in the immediately surrounding atmosphere until the stock is applied to said wire to displace said steam therefrom.

8. The method of eliminating air bubbles from the forming wire of a paper machine during travel thereof around the breast roll to the initial forming zone where the stock is applied thereto, which comprises the steps of supplying steam to a substantially enclosed space bounding and immediately ahead of the junction between the breast roll and the forming zone under controlled pressure conditions causing said steam to displace air from the interstices of said wire and to remain within and along said wire during entry of said wire into the forming zone for displacement from said wire by the stock.

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